CLAIMS

What is claimed is:

1. A method for receiving a differential M-ary signal having one or more hopped features in a multiuser communication system, the method comprising:

receiving a co-channel signal including a target-user differential M-ary signal and one or more interfering other-user differential M-ary signals;

detecting at least one hopped feature per a predetermined time interval of the co-channel signal;

constructing a trellis model for each user using detected hopped feature values as nodes; and

determining soft-decision estimates of data bits included in the co-channel signal for each user, using the corresponding trellis model.

2. The method of claim 1 wherein the hopped feature is at least one of frequency, time, phase, amplitude, code, duty cycle, polarity, dwell time, and basis function.

3. The method of claim 1 further comprising:

removing estimated contributions of the interfering other-user differential M-ary signals using multiuser detection (MUD), thereby providing an interference-cancelled signal; and

re-decoding ambiguous data estimates remaining in the interference-cancelled signal

4. The method of claim 3 further comprising:

in response to determining iteration is likely to improve the quality of the re-decoded data estimates, repeating the removing and re-decoding; and

in response to determining iteration is not likely to improve the quality of the re-decoded data estimates, providing the re-decoded data estimates as final decoded data.

5. The method of claim 3 further comprising:

repeating the removing and re-decoding one or more times.

6. The method of claim 3 further comprising:

providing the re-decoded data estimates as final decoded data.

7. The method of claim 1 further comprising:

providing the soft-decision estimates as final decoded data.

8. The method of claim 1 wherein determining the soft-decision estimates includes generating estimates of the data bits based on a cumulative soft-valued metric.

9. The method of claim 1 wherein determining the soft-decision estimates includes providing a confidence value for each estimate.

10. The method of claim 1 wherein further comprising:

inferring missing nodes of the trellis model from existing nodes based on one or more detected hopped feature values; and

correcting for burst errors.

11. A system for receiving in a multiuser communication environment a co-channel signal including a target-user differential M-ary signal and one or more interfering other-user differential M-ary signals, the system comprising:

an initial decoding module adapted to detect at least one hopped feature per a predetermined time interval of the co-channel signal, thereby enabling construction of a trellis model for each user using detected hop feature values as nodes, and to determine soft-decision estimates of data bits included in the co-channel signal for each user, using the corresponding trellis model; and

an interference cancellation and re-decoding module operatively coupled to the initial decoding module, and adapted to remove estimated contributions of the interfering other-user differential M-ary signals using multiuser

detection (MUD) thereby providing an interference-cancelled signal, and to re-decode ambiguous data estimates remaining in the interference-cancelled signal.

12. The system of claim 11 wherein the hopped feature is at least one of frequency, time, phase, amplitude, code, duty cycle, polarity, dwell time, and basis function.

13. The system of claim 11 wherein the initial decoding module includes:

a hopped feature detector for detecting the at least one hopped feature per a predetermined time interval of the co-channel signal; and

one or more soft decision trellis decoders for determining the soft-decision estimates of data bits.

14. The system of claim 13 wherein each soft decision trellis decoder is further adapted to generate estimates of the data bits based on a cumulative soft-valued metric.

15. The system of claim 13 wherein each soft decision trellis decoder is further adapted to provide a confidence value for each estimate.

16. The system of claim 13 wherein each soft decision trellis decoder is further adapted to infer missing nodes of trellis model from existing nodes based on values of the one or more detected hopped features, and to correct for burst errors.

17. The system of claim 11 wherein the interference cancellation and re-decoding module includes:

one or more multiuser detectors for removing the estimated contributions of the interfering other-user differential M-ary signals for each user; and

a corresponding soft decision trellis decoder operatively coupled to each multiuser detector, for re-decoding the ambiguous data estimates remaining in the interference-cancelled signal.

18. The system of claim 11 further comprising:

an iteration controller operatively coupled to the interference cancellation and re-decoding module, and adapted to provide the re-decoded data estimates for further processing by the interference cancellation and re-decoding module when appropriate, based on an iteration rule;

wherein in response to determining that iteration is not likely to improve the quality of the re-decoded data estimates, the iteration controller provides the re-decoded data estimates as final decoded data.

19. A method for receiving in a multiuser communication environment a co-channel signal including a target-user differential M-ary signal and one or more interfering other-user differential M-ary signals, the method comprising:

decoding the co-channel signal based on a hopped feature associated with the co-channel signal, thereby providing soft-decision estimates of data bits included in the co-channel signal for each user;

removing estimated contributions of the interfering other-user differential M-ary signals using multiuser detection (MUD), thereby providing an interference-cancelled signal; and

re-decoding ambiguous data estimates remaining in the interference-cancelled signal.

20. The method of claim 19 wherein the hopped feature is at least one of frequency, time, phase, amplitude, code, duty cycle, polarity, dwell time, and basis function.

21. The method of claim 19 further comprising:

repeating the removing and re-decoding one or more times.

22. The method of claim 19 further comprising:

providing the re-decoded data estimates as final decoded data.

23. The method of claim 19 wherein decoding the co-channel signal includes:

detecting the hopped feature per a predetermined time interval of the co-channel signal;

constructing a trellis model for each user using values of the detected hopped feature as nodes; and

determining soft-decision estimates of data bits included in the co-channel signal for each user, using the corresponding trellis model.